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ABSTRACT

A comprehensive course of study for natural resources was developed and offered to eleventh and twelfth grade students as an elective, to determine whether such a program was feasible in a high school vocational setting. An area-wide survey of environmental occupations was conducted and an advisory committee made recommendations as to course content, which was based on a curriculum developed by the Pennsylvania State University Agriculture Education Department. Students were enrolled for two years, three class periods per day, five days a week, with one-half of the instructional time spent in classroom subjects and the other half in mechanics. Extensive field experiences were also conducted. After three years of program operation, conclusions are that students previously turned off by school now appear to have more tolerance for school because they have a program of interest and one with which they can identify. A second class section of first year students was added to accommodate increased interest, and the local school board agreed to fund the program when federal assistance is no longer available. Graduates of the program are all employed, many of them in natural resources or related occupations. Recommendations included establishing programs of this nature in other schools and conducting follow-up studies of employment patterns of graduates. (A natural resource course of study is appended.) (BL)

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FINAL REPORT

A CAREER APPROACH TO NATURAL RESOURCE MANAGEMENT IN WILDLIFE AND RECREATION

20-6812
Cont. of Project No. 5807
19-

Leverne A. Barrett
Rodney P. Mack

CONRAD WEISER AREA SCHOOL DISTRICT

ROBESONIA, PENNSYLVANIA

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Special appreciation is given to the Conrad Weiser Area School Board for their vision in sponsoring the program.

Recognition is given Mr. Rodney Mack, Natural Resources Instructor, for his skill in human relations and expertise in the natural resources field.

INTRODUCTION AND PROCEDURE

A career Approach to Natural Resources Management in Wildlife and Recreation was a curriculum approach, to determine whether such a program was feasible in a vocational setting in a comprehensive high school.

Students enrolled were eleventh and twelfth graders from Conrad Weiser Area High School. Students were not enrolled in any other vocational program. Most of the students that enrolled in this elective program had an expressed interest in wildlife. The program served as an alternative for many students, that until this program was initiated, did not have a curriculum choice that was of high interest to them.

Students were enrolled for two years. Each group was in the program for three class periods per day, for a five day week.

One half of the instructional time was spent in classroom subjects and the other half in mechanics. Both phases of the instructional program was enhanced by extensive field experiences, directly related to the experiences being studied in school.

Curriculum was based on a program developed by the Agriculture Education Department, Pennsylvania State University, Career Education in the Natural Resources. From this basic curriculum a comprehensive course of study for natural resources was developed. See Appendix A. An area wide survey of occupations was conducted. Also an advisory committee made many recommendations as to course content. The instructional program was directed by Mr. Rodney Mack, B.S., M.Ed. in Agricultural Education. He has a speciality in wildlife and mechanics. The program has been expanded and is currently operating without federal assistance in the Conrad Weiser High School.

This project attempted to determine answers to the following questions:

1. How well does the material in the publication Career Education in the Natural Resources, A Suggested High School Curriculum Guide produced by the Agriculture Education Department, Penn State University, adapt to field use in a specifically designed course in natural resources?
2. How well can students perform the skills needed for entry-level employment in wildlife and recreation occupations as measured by performance objectives?
3. What are the changes in cognitive knowledge in wildlife and recreation occupations, as the result of instruction, as measured by pretest, post-test, and periodic examinations?
4. What will be the change of student's attitudes toward schooling and the environment as a result of this learning experience as measured by the School Sentiment Index and the Barrett Environmental Attitude Scale?
5. How well will students complete an approved occupational experience program in wildlife or recreation as measured by completion of satisfactory record books?
6. What are the manpower needs for employment in wildlife and recreation in the surrounding area; in the public and private employment sector?

FINDINGS AND ANALYSIS

Results are reported in the same order as the research questions are listed.

1. Penn State Natural Resources Guide. The "Curriculum Guide" was found to be quite satisfactory as a basic guide for curriculum planning. However, several problems were encountered: 1. Curriculum as designed tends to be too technical; 2. Suggested activities are good but many cannot be carried out within the framework of a high school program, more time is required than three class periods per day. Educators should plan to select those activities which will best suit their needs.

2. Instructor's Evaluation of Skill Achievement

Table I is a subjective evaluation by the class instructor as to the level of achievement that the three groups attained. Wildlife management and the mechanical areas received the highest ratings. Fish management, wastewater treatment, and recreation area are examples of those class subject areas that were rated low.

3. Cognitive Knowledge

Mean scores for cognitive knowledge in wildlife and recreation are shown in Table II. The greatest improvement of mean scores occurred in this area. The greatest improvements between pre and post-tests occurred with the cognitive II measurement.

4. School Sentiment Index

Scores for the School Sentiment Index are presented in Table III. Generally there was very little improvement. However, it is worth noting that the pretest was administered at the beginning of the school year and the post-test at the end of the school year; any change in scores is noteworthy in light of this.

5. Environmental Attitude

Students' environmental attitude scores are shown in Table IV. Generally mean scores did not change. Group I had the greatest change in 1975-76.

6. Occupational Experiences

A. Individual Learner Projects: The first group of students has successfully completed 75% of their individual projects. Four project books placed 1, 2, 3, and 4 in the county project evaluation contest. One record book attained second on the regional level and a bronze metal in the state.

Table I. Instructor's Evaluation of the Third Year Group as to Their Achievement of Compentencies as a Group

Low	Med.	High		
X*			1.	fish management
	X		2.	management of forest resources
		X	3.	wildlife management
	X		4.	land use planning
	X		5.	soil conservation
X			6.	water supply
X			7.	waste water
	X		8.	hand painting, glazing, spray painting
		X	9.	concrete and masonry
		X	10.	electric welding
		X	11.	plumbing
		X	12.	small gas engines
X			13.	electricity
		X	14.	vehicle maintenance
	X		15.	soldering
	X		16.	oxyacetylene welding
		X	17.	building construction
	X		18.	land measurement
	X		19.	recreational use of natural resources
X			20.	resource recreational business aspects
X			21.	summer recreation areas
X			22.	winter recreation areas
	X		23.	soil morphology, formation, and classification
	X		24.	soil fertility
X			25.	irrigation water management
	X		26.	employability skills

*Indicates class (group) achievement.

Table II. Students' Mean Scores for Cognitive Knowledge

		Pretest	Post-Test
Group I			
1974-75	Test I	18	27
	Test II	41	61
1975-76	Test III	18	25
Group II			
1975-76	Test I	19	29
	Test II	45	66
1976-77	Test III	16	26
Group III			
1976-77	Test I	18	29
	Test II	44	67

Table III. Students' Mean Scores for School Sentiment Index

	Pretest	Post-Test
Group I		
1974-75	197	200
1975-76	191	202
Group II		
1975-76	199	208
1976-77	197	206
Group III		
1976-77	199	183

* * * * * *

Table IV. Student's Mean Scores for Environmental Attitude

	Pretest	Post-Test
Group I		
1974-75	159	159
1975-76	148	168
Group II		
1975-76	158	163
1976-77	138	144
Group III		
1976-77	153	151

B. Group Projects: There have been many learning hours involved in work accomplished; these experiences have provided the most valuable learning experiences. Examples of these activities are: construction of a group learning area in the school's outdoor laboratory, construction of a hunter safety trail, complete construction of a trout raceway in cooperation with the Pa. Fish Commission and the Cocalico Watershed Association; timber stand improvement in cooperation with the Cushion Peak Rod and Gun Club and individual land owners and students' study areas, construction of a hiking trail with wildlife habitat improvements and a camp owner survey. Learning activities that have been accomplished are: additional stream improvement work; fish studies at the trout raceway; visitation to camps to study their organization development of camp plans for physical facilities and began a class wildlife improvement project of a 10 acre tract.

These group projects have provided actual learning experiences. In addition they have helped develop a feeling for public and community organizations as well as aiding the learners to develop a sound environmental ethic.

7. Manpower Needs

Nineteen camp owner-managers replied to a mailed questionnaire. The results of that survey are shown in Table V. Five skill areas were rated high as to their importance in camp operation: management of forest resources, land use planning, small gasoline engines, recreational use of natural resources and summer recreation areas.

Table V. Rating by 19 Camp Owner-Managers of Skill Areas of the Natural Resources Curriculum

Rating			Skill Area
Low	Med.	High	
*4	6		1. fish management
2	3	7	2. management of forest resources
3	6	3	3. wildlife management
	4	5	4. land use planning
2	5	3	5. soil conservation
1	7	3	6. water supply
3	7	2	7. waste water
3	6	4	8. hand painting, glazing, spray painting
4	9	1	9. concrete and masonry
5	5	1	10. electric welding
3	9	2	11. plumbing
5	2	5	12. small gas engines
3	10	1	13. electricity
2	8	4	14. vehicle maintenance
6	6		15. soldering
7	3		16. oxyacetylene welding
1	11	2	17. building construction
4	4		18. land measurement
	6	6	19. recreational use of natural resources
2	3	3	20. resource recreational business aspects
1	7	5	21. Summer recreation areas
5	6	1	22. winter recreation areas
8	2		23. soil morphology, formation, and classification
9	1		24. soil fertility
7		1	25. irrigation water management
1	4	2	26. employability skills

*Number of managers who rated that skill low, med., high.

A majority of the respondents rated many of the skill areas of medium importance. Those with a high mean rating are: concrete and masonry, plumbing, electricity, and building construction. Several of the areas that were rated low were: welding, soil morphology and soil fertility.

In addition to the information shown in Table I, information as to the type of camp, occupational titles employed, number of employees (full and part time), and the outlook for employees within the next three years is shown in Table VI. The survey used can be seen in Appendix A.

For the camps that replied to the survey, many of them are of a diversified nature as to the type of camp. Campgrounds showed the most diversity as to camp type. A wide range of occupational titles are employed at these camps. A good number of positions will be open for future employees.

Table VI. Results of Owner-manager Survey Showing Camp Types, Occupational Titles Employed and Occupational Outlook

Camp Name	Camp Type	Occupational Titles Listed	Number of Employees Full	Part	Outlook
Cocalico Creek	Campground * a-f	Prop. Manager Lifeguard Maintenance Super.	3		4
French Creek State Park	State Park a e f	Camp Admin. Camp Counselor Secretary	15	30	20
Camp Conrad Weiser	YMCA	Sanitarian		65	210
Circle M Ranch	Campground a b c e f	Camp Ser. Dir. Bunk Counselor	3	35	
Christmas Pine	Campground a b c d e f	Prog. Admin.		4	
Girl Scout Council	Camp a b c d e f	Maintenance Man Exec. Director		12	
Camp Swatara	Church Camp a b c e f	Family Camping Center Director	2	3	
Lighthouse Arts and Music	Private	Ranger Equip. Operator		60	30
Starlight	Campsite a b c d e f	Carpenter	3	2	7
PA Dutch	Campsite Private a b c d e f	Laborers Semi-Skilled Laborers Camp Manager	2	1	3 years
Boy Scouts	Camp a b c d e	Curator Ass't. Curator	2	60	200
Appalachian	Private Campsite a b c d e f		4	3	3
Blue Mountains	YWCA		2	26	1
Jewish Community Center	Day Camp d		1	3	
Camp Van Dor	Day Camp h			3	
Hawk Mountain			4	3	
Caroline Stephens	Campfire a b c d e		8	35	Part time

*Letters denote type of camp. Refer to Table VIa for camp types.

Table VIa. Types of Camps Designated in Table VI

A. Type of Camp

1. Organized camp

a_____YMCA

b_____YWCA

c_____Boy Scouts

d_____Girl Scouts

e_____Campfire

f_____Service Club

g_____Church Related

h_____Private

i_____Other (Name_____)

2. Campground

a_____Overnight

b_____Week-end

c_____Weekly

d_____Seasonal

e_____Tent

f_____Trailer

CONCLUSIONS AND RECOMMENDATIONS

Following three years of program operation several observations can be made. Many students who elected this program were turned-off with school. It does appear that they have more tolerance for school because they have a program of interest to which they can identify. Students identify with the program and show "ownership." The students point with pride to a number of projects in the community in which they participated.

Local "proof" of the program's success can be seen as a result in student enrollment. A second class section of first year students has been added to accommodate increased interest. Secondly, the local district school board has agreed to fund the program, even though federal assistance is no longer available.

The community survey of occupations indicates a need for persons who have skills in wildlife-recreation natural resources. Several problems with student job placement arose, they are:

1. Positions in public organizations of fish and game are difficult to acquire because of age limitations.
2. The largest number of jobs are available in the campground sector of natural resources. However, students recently graduating from high school are reluctant to travel, or move to another location to get these jobs.

The end result of any vocational program is whether graduates are employed. At this time all of the graduates of this program are employed. Not all graduates are employed in natural resources, however, many are employed in positions that are related to natural resources. Some examples of jobs these students are employed in are: carpentry, landscaping, installation of drain tile, construction, tree surgery, mechanics, etc. Even though many students did not get jobs in natural resources immediately following graduation, their genuine desire and occupational goal is to do so.

A final note about employment. As graduates of the natural resources program become employed in the occupations of their choice, that in itself will stimulate additional openings and opportunities for further employment. As graduates mature following graduation, they will be able to overcome several of the obstructions such as minimum age requirements. In time some may gain enough equity to begin their own businesses in natural resource, i.e. campground owners.

OUTCOMES

The results of this study indicate applications for other areas. Several of these are:

1. There is genuine student interest in pursuing natural resource occupations.
2. The recreation natural resource industry has expressed a sincere interest in the program as well as a need for trained persons.
3. A workable natural resources curriculum has been developed and is available to other schools. (See Appendix C)
4. Additional information has been found concerning occupational information in recreation natural resources and the nature of skills needed for employment.
5. A program in natural resources can change environmental attitudes of participant students as well as positively changing their feelings toward the entire school program.
6. This project has provided an alternative school program for several students whose occupational goals were not clear and who did not find the existing school program suitable for their desires.
7. A successful recreational natural resources program can be carried out in two years of study - grades 11 and 12. Three hours of study the first year and two hours of study the second year is suggested.

It can be concluded that additional programs of this nature are needed and should be established in other schools in the region. New ideas take time to implement and prove themselves, recreation natural resources is no different.

RECOMMENDED RESEARCH

Currently, the Assistant Principal of Conrad Weiser High School is conducting an independent, evaluative study of this program.

Follow-up studies of employment patterns of graduates would be helpful approximately three years after graduation.

A study to investigate the relationships of students' I.Q., reading ability and mechanical ability with success in achieving occupational choice is needed with appropriate experimental controls.

Appendix A

CONRAD WEISER AREA SCHOOL DISTRICT
Robesonia, Pennsylvania

RECREATION NATURAL RESOURCES SURVEY

Name:

Date:

Address:

I. DIRECTIONS: Check the appropriate information below.

A. Type of Camp

1. Organized camp

a___YMCA

b___YWCA

c___Boy Scouts

d___Girl Scouts

e___Campfire

f___Service Club

g___Church related

h___Private

i___Other (Name) _____

2. Campground

a___Overnight

b___Week-end

c___Weekly

d___Seasonal

e___Tent

f___Trailer

II. DIRECTIONS: Complete the following for each job title that is employed by your organization. Use as many as necessary.

A. Number of people employeed yearly; Part-time _____ Full-time _____

B. Employee

1. Job title _____

a. Short description _____

_____

_____

C. Education required

1._____High School

2._____2-Year College

3._____4-Year College

4._____Experience

D. Salary or wage_____

2. Job title _____

a. Short description _____

_____

_____

C. Education required

1._____High School

2._____2-Year College

3._____4-Year College

4._____Experience

D. Salary or wage_____

3. Job title _____

a. Short description _____

_____

_____

C. Education required

1. ____ High School

2. ____ 2-Year College

3. ____ 4-Year College

4. ____ Experience

D. Salary or wage _____

4. Number of employees expected to be hired in the next three years ____.

III. DIRECTIONS: Please check those activities offered at your facilities.

1. ___swimming
2. ___horseback riding
3. ___boating
4. ___biking
5. ___fishing
6. ___tennis
7. ___indoor activities
8. ___hiking
9. ___miniature golf
10. ___archery
11. ___gunning
12. ___winter sports
13. ___baseball
14. ___others (specify)_____ _____ _____

IV. DIRECTIONS: Below are listed several areas of study in which you may require your employees to be skilled. Please check the amount of skill which would be required ranging from low to high.

Low	Med.	High	
___	___	___	1. fish management
___	___	___	2. management of forest resources
___	___	___	3. wildlife management
___	___	___	4. land use planning
___	___	___	5. soil conservation
___	___	___	6. water supply
___	___	___	7. waste water
___	___	___	8. hand painting, glazing, spray painting
___	___	___	9. concrete and masonry
___	___	___	10. electric welding
___	___	___	11. plumbing
___	___	___	12. small gas engines
___	___	___	13. electricity
___	___	___	14. vehicle maintenance
___	___	___	15. soldering
___	___	___	16. oxyacetylene welding
___	___	___	17. building construction
___	___	___	18. land measurement
___	___	___	19. recreational use of natural resources
___	___	___	20. resource recreational business aspects
___	___	___	21. summer recreation areas
___	___	___	22. winter recreation areas
___	___	___	23. soil morphology, formation, and classification
___	___	___	24. soil fertility
___	___	___	25. irrigation water management
___	___	___	26. employability skills

CONRAD WEISER NATURAL RESOURCES COURSE OF STUDY

VOCATIONAL AGRICULTURE

Appendix B

I. Soil & Soil Technology — Suggested Time Hrs. - 60

A. Unit description and overall objectives:
   1. Identify five factors which affect soil formation
   2. Distinguish major horizons in soil profiles and describe the major characteristics of each.
   3. Determine the moisture content and permeability group of soil
   4. List the land use capability classes and optimum uses for each
   5. Demonstrate the ability to read and interpret soil maps
   6. Using samples of soil and soil test kits to analyze a sample of soil for pH
   7. Make plant tissue test
   8. Explain fertilizer analysis

B. Following the completion of the unit Soil and Soil Technology the student can:
   1. Determine the properties of soil
      a. Chemical, biological, physical
      b. Formation and weathering
      c. Organic matter
   2. Classification of soil and land use
   3. Recognize types of erosion
   4. Make land use recommendations and land classes
   5. Recognize and explain controls for erosion and sedimentation
   6. Make a soil survey and analyze it for proper use
   7. Analyze plant tissue and soil samples
   8. Maintain and increase organic matter
   9. Understand basic fertilizer practices
      a. Commercial
      b. Green manure and cover crops
      c. Animal manure
   10. Understand basic liming practices

II. Water — Suggested Time Hrs. - 60

A. Unit description and overall objectives:
   1. List the three sources of water for home and industrial use and estimate the water needs for a community
   2. Describe the effects of storage on water and identify six factors which control these effects
   3. Recognize visible sources of pollution on a watershed and prescribe measures of eradication
   4. Conduct and analyze water
   5. Outline a program for maintaining a wastewater collection system and list five different methods for treating sewage
   6. Recognize visible indications of pollution in lakes and streams, describe probable causes
   7. List 5 kinds of industrial waste and describe how each pollutes the waters.
   8. Design and map an irrigation system for a given set of conditions and defend the system selected.

B. Following completion of the unit Water the student can:
1. Recongnize the sources for water
2. Estimate the demands for water
3. Describe and recognize the factors involved with water storage
4. List and recognize the effects of storage on water and evaluate the water quality
5. List the purposes of the various methods of water treatment
6. Demonstrate the ability to estimate the volume of wastewater from a community or subdivision, given the data.
7. List the five methods of treating wastewater and describe each
8. Recognize the effects of liquid wastes on streams and lakes
   a. Zones of pollution
   b. Methods of recovery
   c. Biological life of pollution
   d. Bottom deposits
   e. Industrial wastes
9. Define hygroscopic, capillary, and gravitational water
10. Identify terms associated with irrigation.
11. Design and map an irrigation system for a given set of conditions and defend the system selected.
12. Measure irrigation water and determine soil moisture.
13. Determine when, how much, and how often to irrigate
14. Isolate problems of water penetration
15. Outline procedures for draining a given field, considering:
    a. Type of system
    b. Layout of system
    c. Sources of technical assistance
    d. Soil classification

III. Wildlife Management — Suggested Time Hrs. - 125

A. Unit description and overall objectives:
1. Recognize and describe the basic needs and relationships that exist in all wildlife.
2. Outline a plan for stimulating native and introduced game populations on a given piece of land, considering:
   a. Cover crops
   b. Food
   c. Nesting area
   d. Living space
3. Recognize and list the common species of game birds and animals in this state, select for propagation, and identify its habitat and requirements.
4. Outline a plan for hatching, brooding, rearing and releasing a given specie of game bird, including:
   a. Age of bird
   b. Stocking rate
   c. Handling of birds
   d. Providing food and cover

5. Determine animal populations in a given area at a certain season by selecting an appropriate census taking technique, outlining the observation routine and describe conditions.
6. Evaluate food and cover areas

B. Upon completion of the Wildlife Management unit, the student can:

1. Collect and record information on wildlife in a specific area.
   a. Determine physical condition and identify wildlife
   b. Inventory available feed for wildlife and evaluate the habitat.
   c. Inventory species of wildlife and take a census of wildlife killed in a specific area.
   d. Determines the balance of animals to food supply.
   e. Captures and marks wild animals by trapping or immobilizing using coloring, marking or tagging techniques.
2. Assists in the development and operation of controlled wildlife areas
   a. Projects the number of licenses to be issued in accordance with maintaining wildlife balance.
   b. Keeps records on daily kill and census.
   c. Conducts public relations functions with users by:
      1.) Explaining wildlife objectives to individuals and groups.
      2.) Preparing literature for the public.
3. Supervise operation of equipment, facilities, and personnel.
   a. Prepares seed beds
   b. Controls the proper handling of seedlings, trees and shrubs
   c. Provides necessary assistance in tree, seedlings and shrub planting.
   d. Interprets and applies directions and/or specifications.
   e. Adjusts and operates equipment and implements for maximum efficiency and safety.
   f. Performs preventative maintenance and necessary field repairs.
4. Gathers samples of water, food and soil
   a. Selects possible areas to sample
   b. Gathers representative samples
   c. Prevents contamination of samples
   d. Analyzes water samples for pH, Ph, N, pesticide residues and contaminants
   e. Analyzes food samples for pesticide residues
   f. Analyzes soil samples.
5. Locates and establishes boundaries for game lands, game preserves, or wildlife improvement areas
   a. Interprets and uses aerial photographs, topographic maps to aid in identifying areas and boundaries.
   b. Plot data on existing maps
   c. Make maps of study area.

6. Assists in the enforcement of game laws during peak periods of hunter activity
   a. Explains local hunting restrictions
   b. Patrols assigned areas
   c. Refers game law violations observed to supervisors.
   d. Properly marks areas.
7. Supervises non-professional and temporary field personnel.
   a. Interprets directions.
   b. Plans and administers work schedules.
   c. Helps train new personnel.

IV. Fish Management

Suggested Time Hr. - 11

A. Unit description and overall objectives:
   1. Identify the common game and non-game fish.
   2. Write and map a workable plan for establishing a fish pond, considering:
      a. Soil and topography
      b. Size and construction
      c. Water supply, quality and system
      d. Fish species
      e. Carrying capacity
   3. Test the oxygen content of the water to an accuracy of 2 ppm and prescribe a remedial program.
   4. Test pH of water to within 1 pH level of accuracy.
   5. Test water temperature of a lake or pond with accuracy within ± 2°. Determine stratification and fish adaptability.
   6. Develop a complete written management plan for a designated stream, lake, or pond considering:
      a. Oxygen supply
      b. Controlling undesirable fish, snakes, frogs, weeds, diseases, parasites.
      c. Fishing pressure, feasibility, and timing of stocking.
   7. Write and map a workable plan for establishing and managing brood ponds.
   8. Prescribe a feeding program for fry and growing fish.
   9. Determine stocking rates.
   10. Handle at least 50 live bass or trout with a mortality rate of less than 5 percent and place in a public or private water course.

B. Upon completion of the Fish Management Unit, the student can:
   1. Identify different species of game fish, panfish, bait fish, and trash fish.
      a. Knows coloration, shapes and sizes.
      b. Understands feeding habits, and fish habitat.
   2. Operate and maintain hatchery equipment.
      a. Cleans and repairs tanks and equipment.
      b. Determines stocking rate.
      c. Operates mechanical sorting device.
      d. Knows how to use fish nets, boats, racks and traps.
      e. Disposes of dead fish.

3. Perform mathematical computations.
   a. Counts and records number of fish spawned.
   b. Determines feed ratios
   c. Checks 0_2 level, pH, temperature and hardness of water by using special measuring equipment.
   d. Prepare statistical reports and reports findings.
   e. Determine stocking rate for ponds.
      1.) Calculates surface and running water
      2.) Measures food resources
      3.) Estimates stocking rate and establishes a time for stocking.
   e. Records activities
      1.) Keeps work diary
      2.) Lists mortality rate
      3.) Prepares order forms
   f. Makes surveys(creek)
4. Spawn fish
   a. Understand the life cycle and breeding habits.
   b. Collects semen and fertilizes eggs.
   c. Recognizes diseased and unfertilized eggs.
      1.) Knows types of diseases and warning signs.
      2.) Treats diseases and tests unfertilized eggs.
5. Feed and handle fish
   a. Knows forms and types of feed
   b. Determines proper amounts
   c. Prepares and dispenses food
   d. Knows different ways to stock fish
   e. Stocks ponds and streams and transfers fish without harm
6. Control undesireable vegetation.
   a. Knows common aquatic weeds and recognizes algae blooms.
   b. Uses chemicals or physical means to control environment without harm to the ecosystem.
7. Understand economics and use good management principles.
   a. Calculates potential income.
   b. Determines overhead expenses.
   c. Realizes market potential and sells fish.
   d. Knows hatching procedures.
   e. Understands fish laws.
   f. Records expenses, tools, sales, etc.
   g. Recruits labor.
   h. Provides public relations.
   i. Investigates pollution reports.

V. Management of Forest Resources Suggested Time Hr. - 125

A. Unit description and overall objectives:
   1. On a diagram or model supplied, identify the major parts of a tree.
   2. Identify by common name the important tree species of Pennsylvania, the silvic considerations and various uses of each.
   3. Prescribe proper tree species for planting on a given site based on analysis of site conditions and use goals.
   4. Plant seedlings without damage to the root system following approved practices for:
      a. site preparation
      b. Spacing
      c. Stocking rates and time of planting.

5. Demonstrate the ability to estimate the volume of standing timber and felled trees and prescribe thinning, pruning and weeding of various sites.
6. Demonstrate insect control by listing three major forest insect pests and three chemicals for their control as well as three major tree diseases.
7. Demonstrate an understanding of the behavior of fire by defining and describing:
   a. Fire triangle
   b. Radiation
   c. Convection
   d. Conduction
   e. Ignition temperature
   f. Computing the fire danger index
   g. The effect of fuel size, arrangement and topography
   h. Five major fire fighting tools and equipment.
8. State orally or on paper action required to suppress a fire to 95 percent accuracy when given a situation.
9. Demonstrate an understanding of a watershed and its purpose by mapping and listing the weaknesses within the watershed
10. Safely fell and buck three trees for the purpose of logging experience.

B. Upon completion of the Forestry unit the student can:
1. Survey timber land and other areas
   a. Establish boundary lines, elevations for roads and drainage systems.
   b. Interpret and use aerial photographs, topographic and planimetric maps
2. Cruise timber
   a. Calculates volume of stands.
   b. Measure tree heights and diameters
   c. Determines saleable volume in forest products.
   d. Measures tree growth
   e. Prepares inventory reports, keep records recommends logging methods.
   f. Marks timber and grades forest products
3. Perform timer or multiple use stand improvement work.
   a. Makes proper decision for tasks based on the goals for the area.
   b. Plans and prepares planting site, procures planting stock.
   c. Follows the planting plan and protects the stock.
4. Controls forest insects and diseases.
   a. Identifies 3 insects and diseases and their controls.
   b. Properly and safely handles equipment and pesticides.
5. Prevent and control forest fires
   a. Maintains and uses fire control supplies and equipment.
   b. Assists in determining causes of fires and best control methods.

c. Provides educational programs in fire prevention.
d. Measures fire characteristics and can work on a fire crew.

6. Performs watershed practices
   a. Improves vegetative cover and controls flood run-off to reduce soil damage.
   b. Maintains soil stability and treats land damaged by flood or erosion.
   c. Constructs drainage systems.
7. Manages fish and wildlife food and habitat.
   a. Maintains daily crew records.
   b. Assists in habitat improvement
   c. Assists in taking wildlife census
   d. Keeps hunting and fishing records
   e. Operates and maintains machinery
   f. Supervises controlled hunting and fishing
   g. Stocks, rears and feeds fish and game species.
   h. Reseeds grazing lands by planting and caring for 10 trees and a plot of grass.
8. Communicate between workers and with the community
   a. List five basic transmitting codes and use a two way radio.
   b. Make at least one news article, poster or speech to inform the public.

VI Practical Electricity

Upon completion of this course the student will be able to successfully plan electrical layouts, install and repair electrical wiring, electrical fixtures and distribution apparatus; and select, clean, and maintain electric motors. To develope these competencies the student:

A. Discovers what occupations are available in farm and home electrification 2
   1. Lists skills required for various occupations
   2. Explores education needed to enter and advance
   3. Understands the role of electricity in agriculture today.

B. The student understands and applies various electrical terms (volts, amperes, watts, circuit, resistance, ohms, switch, direct current, alternating current) 5

C. The student identifies and applies various electrical equipment and tools 7
   1. Identifies wire sizes and their current-carrying capacities

		Suggested Time Hrs.
	2. Identifies types of wire and cable insulation	
	3. Identifies types of box construction and various plates and covers	
	4. Identifies types of switches and lists their uses	
	5. Identifies types of outlet receptacles and lists their uses	
	6. Identifies and properly uses various electricians tools (Lineman's pliers, side cutting pliers, diagonal cutting pliers, chair nose pliers, conventional and phillips screwdrivers, multi-purpose tools, VOM meter, file, and knife)	
D.	The student calculates and installs service requirements.	3
	1. Installs meter socket	
	2. Drills hole for conduit entrance	
	3. Instals 100 Amp service panel	
	4. Connects conduit to top of the meter socket	
	5. Places conduit meter to 100 Amp service panel	
	6. Cuts and rips installation from ends of cable	
	7. Installs maithead and pushing cable	
	8. Grounds service entrance	
E.	The student understands basic wiring procedures	7
	1. Interprets wire color coding and polarizing	
	2. Connects wires to terminals properly	
	3. Uses solderless connectors	
	4. Installs boxes in various situations	
	5. Mounts fixtures	
	6. Understands the use and function of circuit breakers and fuses	
F.	The student installs wiring circuits	7
	1. Installs parallel grounded receptacles	
	2. Installs lamp receptacles	
	3. Installs a toggle switch (single pole and three way)	
	4. Understands installation of four way switch	
	5. Installs a 220 volt receptacle	
G.	The student understands maintenance of a lighting and wiring system	7
	1. Replaces an attachment plug	
	2. Replaces a lamp socket	
	3. Replaces a heater plug	
	4. Understands the removal of excess sag from wires between buildings.	
	5. Understands the splicing of a broken wire between buildings	
	6. Lists practices in maintaining fluorescent lighting units.	

	Suggested Time Hrs.
H. The student understands factors to consider in selecting an electric motor	2
1. Identifies electrical characteristics to be considered.	
2. Lists physical characteristics	
I. The student lists proper wiring procedures for installing an electric motor.	2
J. The student services and maintains electric motors	3
1. Disassembles and cleans an electric motor.	
2. Lubricates an electric motor	
3. Reassembles an electric motor	
K. The student reverses an electric motor	1

Suggested Time Hr. - 80

VII. Recreational Use of Natural Resources

A. Unit description and overall objectives:

1. Recognize and list the various demands by the public for different types of outdoor recreation experiences.
2. Recognize and list the different types of natural resources recreational areas, the kinds of services and facilities required, and the income potential from various enterprises.
3. Carry out an effective inventory of the recreational enterprises in an area considering:
   a. Location of enterprises
   b. Types of facilities
   c. Cultural treatment of vegetation
4. Maintain the camp facilities in a safe and healthy way

B. Upon completion of the Unit Recreational Use of Natural Resources the student can:
   1. Analyze the demand for recreation
   2. Analyze the kinds of outdoor recreational enterprises
   3. Explore the opportunities for establishing a recreational enterprise and sources of supplemental income.
   4. Determine the suitability of a site for a particular recreational enterprise.

VIII. Seasonal Recreational Areas Suggested Time Hrs. - 75

A. Unit description and overall objectives:
   1. Analyze all available materials and external factors in selecting a site for a recreational area
   2. Recognize all internal factors concerning the physical features in selecting a recreational site.
   3. Carry out an effective inventory of a proposed recreation area through the preparation of a survey of physical features and a written report of recommendations.
   4. Develop a workable campground design and a workable plan for the maintenance of a developed recreation area.

B. Following the completion of the unit Seasonal Recreation Areas the student can:
   1. Maintain and repair the camp water system
      a. Maintains, repairs, samples, and recognizes damages to the water system
      b. Collects monthly water samples and conducts chlorination procedures
      c. Checks and controls alge growth
   2. Maintains and repairs the camp sewage system
      a. Maintains and recognizes damage to the sewage system
      b. Licensed to operate a treatment plant when necessary
   3. Maintains and repairs camp structures and following a schedualed maintenance and repair program.
      a. Paints old or builds new buildings and facilities
      b. Makes general repairs
   4. Maintains and repairs walks, parking areas, roads and campsites
      a. Maintains gravel, asphalt, and non-paved roads and makes minor repairs
      b. Mixes, pours and finishes concrete
      c. Maintains and repairs campsites
   5. Maintain sanitary conditions
      a. Disinfects and maintains sanitary facilities
      b. Maintains and cleans both houses
      c. Removes rubbish from the campground areas
      d. Applies insecticides safely to control mosquitos, flies, and ants; must have license
      e. Controls rodents
   6. Practice horticultural practices
      a. Uses safety practices when using, maintaining, and servicing machinery and equipment and does by use of the operator's manual
      b. Adjusts equipment under field conditions for maximum efficiency and longer life.

c. Repairs small equipment
   1.) Recognizes malfunctions, makes repairs, orders replacement parts
   2.) Recommends acquisition of new equipment and major repairs
d. Recognizes, controls and clears weeds, brush and unwanted trees
e. Treats damaged trees and shrubs for insects and diseases
f. Maintains and repairs the camp swimming pool
   1.) Cleans the pool daily
   2.) Checks chlorine content and physical hazards daily
   3.) Recognizes any damage and winterizes the pool
   4.) Cares for lifesaving equipment

7. Develop campgrounds and picnic areas
   a. Providing for safety and sanitation needs
   b. Selecting a site for a campground
   c. Laying out the campground
   d. Laying out the picnic area
8. Develop water-oriented recreational enterprises
   a. Swimming
   b. Marinas
   c. Fishing resorts
9. Planning hiking and riding trails
   a. Locating
   b. Marking
   c. Bridging
   d. Rest areas
   e. Use of trailbikes
10. Planning and Operating a hunting preserve
   a. General and special features
   b. Hunting and trapping fees, rights, and services
11. Planning and operating a riding stable
   a. Horses and riding equipment
   b. Housing and feeding stock
   c. Horse shows
12. Planning and operating a skiing area
   a. Trails
   b. Lifts
   c. Skis and skiing equipment
   d. Patrolling the slopes
13. Plan sled and snowmobile areas
   a. Trails
   b. Renting equipment
   c. Patrolling the area
14. Plan an ice skating area
   a. Facilities
   b. Offering lessons
   c. Renting equipment

IX. Small Gasoline Engines I — Suggested Time Hrs. - 105

A. Repair, operation and maintenance of two and four cycle engines. 3/4 laboratory and 1/4 theory that covers combustion ignition and carburetion problems. Students will have the opportunity to overhaul one of their own engines.

Upon completion of the course, the student can

1. Explain the operation of a 2 and 4 cycle engine
2. Use service manuals to obtain parts numbers, prices, repair procedures, clearances, etc.
3. Demonstrate the ability to use small gas engine tools and equipment
4. Identify all parts and principles included in compression, carburetion, and ignition systems.
5. Use parts cleaner, ignition tester, cylinder hone, coil and condenser tester.
6. Remove, check, and replace valves, head, piston, rings, connecting rod, timing gear and crankshaft and check for wear or broken parts.
7. Use dial indicator, micrometer, telescoping gauges and feeler gauge
8. Lap and adjust valves
9. Disassemble, clean, service and/or repair carburetor
10. Understand the basics of operating and repair shop.

X. Small Gasoline Engines II — Suggested Time Hrs. - 70

A. Repair, operation and maintenance of equipment operated with two and four cycle gasoline engines. Totally a laboratory course designed to facilitate learners in their understanding of 2 and 4 cycle equipment such as snowmobiles, lawnmowers, trailbikes, marine engines. The student must provide his own equipment for the course (excluding tools) Prerequisite - Small Gasoline Engines I

B. Upon completion of the unit the student can:
   1. Demonstrate his ability to use repair manuals effectively
   2. Demonstrate a professional knowledge of the operation of a number of small gasoline engines.
   3. Be able to perform routine inspection, maintenance and major repair of recreational vehicle equipment.

XI. Tractor Maintenance and Tune-Up — Suggested Time Hrs. - 45

A. Understand the principles of operation; construction and major components; adjust valves, electrical and ignition systems; air, fuel, and exhaust systems; cooling systems; maintain and adjust power trains, brakes, steering; selecting lubricants.

B. Upon completion of this unit the student can:
   1. Inspect the tractor for needed visual repairs
   2. Adjust valves properly.
   3. Inspect, clean, and service spark plugs, distributor, starter motor, generator, battery.
   4. Time an engine by breaker point and timing light methods.

5. Service and adjust the air, fuel and exhaust systems.
6. Maintain and adjust the cooling system by servicing.
7. Adjust a hand or foot operated clutch
8. Adjust the power train components.
9. Check and/or adjust alignment of front wheels.
10. Clean and service front wheel bearings
11. Check and service tires
12. Analyze by dynamometer and compression tests, the condition of the engine.
13. Overhaul an engine if needed.
14. Inspect transmission for wear and function.

XII. Recreation - Land Use and Planning Suggested Time Hrs - 60

A. Unit description and overall objectives
1. Recognize and describe the functions and components of comprehensive plans and zoning ordinances
2. Demonstrate proficiency in assembling factual information pertinent to developing a comprehensive plan, correctly read and interpret soil survey and land use maps, and utilize information in natural resources plans.
3. Obtain land distances, declination, slope, traverse and area by the various field measuring techniques.
4. Establish work habits that allow work to be done in the field and compiled in the classroom by using stadia data, plots horizontal distance and bearings.
5. Calculate acreage of plotted closure within allowable error of 1 acre/20/
6. Given drafting instruments, prepare a finished map of a plotted area.
7. List specific agencies and their purpose, ways to contact them and in what ways they serve the community.

B. Upon completion of the Land Use and Planning unit the student can:
1. Develop a comprehensive plan using:
a. Citizen participation
b. All components of a comprehensive plan
c. Assembling factural information
1.) Economic base, civic and social improvements
2.) Soil and water resources
3.) Present uses and natural resource plans.
2. Carrying out the comprehensive plans
a. Informing and involving the public
b. Taking regulatory measures
c. Attaining goals by zoning
3. Utilize measuring devices
a. Pacing
b. Steel tape
c. Compass
d. Surveyors transit
e. Stadia
f. Determination of land area
4. Maps and mapping

XIII. Recreational Business Suggested Time Hrs. - 30

A. Unit description and overall objectives:
   1. Demonstrate basic bookeeping procedures and define terms and realize an importance of it.
   2. Outline a safety program and know the operator's personal responsibilities regarding liability, property, and comprehensive insurance.
   3. Recognize locak, state, and federal laws pertaining to an enterprise and know how to effectively utilize the financial and technical assistance from these sources.
   4. Know the important legislative provisions (i.e. social security, workman's compensation, and minimum wage, taxes, permits, etc.) as well as proposed legislation.
   5. Effectively utilize advertising methods to promote a recreational area activity. Design a brochure for a given recreational enterprise.
   6. Supervise activities of the various employees.
   7. Enforces regulations.

B. Upon completion of the unit Recreational Business students can:
   1. Schedule weekly campground activities of visitors and employees
      a. Schedules entertainment, crafts and craftsmen, sporting events.
      b. Prepares daily and long term maintenance plans.
      c. Orders supplies, equipment and parts.
   2. Manage the campground accounts and records and make periodic reports.
      a. Sells stickers and handles all incoming money.
      b. Keeps weekly financial records and accounts.
   3. Schedules camp site use
      a. Assigns campers to specific camp sites; checks arrival and departure times.
      b. Explains policies and hands out literature of the campground.
   4. Monitor the safety and health of camp visitors.
      a. Establish a safety program.
      b. Need for an insurance program.
   5. Identify financial assistance programs for Recreational development.
      a. Farmer's Home Administration
      b. Production Credit Administration
      c. Commercial banks
      d. Small Business Administration
      e. Agricultural Stabilization and Conservation Service
   6. Identify sources of technical assistance
      a. State Department of Parks and Recreation
      b. Bureau of Outdoor Recreation
      c. Soil Conservation Service
      d. Forest Service
      e. Cooperative Extension Service
      f. Rural area development

7. Maintain and operate the enterprise
   a. Sanitation
      1.) Sanitation
      2.) Refuse disposal
      3. Vermin and insect control
   b. Water supply
   c. Electric supply
   d. Vegetation control
   e. Area safety
8. Administer the enterprise
   a. Employee and employer relations
      1.) Compensation
      2.) Attitudes and good will
      3.) In-service training
   b. Customer relations
   c. Fee collection
   d. Signs and labeling
      1.) Design
      2.) Maintenance

XIV. Employment Skills — Suggested Time Hrs. - 30

A. Upon completion of the unit Employment Skills the student can
   1. List and briefly explain the main provisions in the Fair Labor Standards Act relating to minimum age, wages and hazardous occupations.
   2. Develop and write a personal resume which gives all the necessary details about his education, experience, personal qualities, and references.
   3. Write a brief application letter of three or four paragraphs featuring the best qualifications of the applicant.
   4. Present himself in a manner acceptable to a person conducting a job interview, using a job checklist as a guide.
   5. Properly introduce fellow students, older persons, and younger persons to another person or to groups.
   6. Effectively carry on a telephone conversation including:
      a. Initiating a telephone conversation
      b. Answering the telephone in a businesslike manner.
      c. Listening to telephone conversation and formulating responses.
      d. Terminating a telephone conversation.
      e. Taking a telephone message and delivering it to the intended receiver.
   7. Handle a sales procedure effectively by going through the six basic steps in selling.
   8. Exhibit a positive system of values for work by demonstrating positive relationships with peers and supervisors.

		Suggested Time Hrs.
XV.	Plumbing and Irrigation Upon completion of this course the student will be able to successfully layout, assemble, install, alter and repair a plumbing system and will be able to successfully design an irrigation system.	
	A. The student developes the ability select proper kinds of pipe and pipe fittings for certain jobs.	4
	1. Identifies sizes and weights of copper tubing	
	2. Identifies different types of plastic pipe.	
	3. Determines the weights, size and construction of steel pipe	
	4. Identifies samples of red and yellow brass pipe.	
	5. Identifies the various fittings used in steel, plastic, and copper pipe.	
	B. The student selects and maintains the proper plumbing tools for a job.	1
	1. Selects and maintains steel pipe cutter, threads and wrench	
	2. Selects and maintains copper tubing cutter, flaring tool, torch, flux, solder, etc.	
	C. The student completes pipe fitting projects	8
	1. Uses a pipe cutter	
	2. Cuts threads with racket stock	
	3. Cuts center to center measurement of black steel pipe, copper tubing, and plastic pipe.	
	4. Flares copper tubing.	
	5. Swedges copper tubing.	
	6. Glues and clamps plastic joint	
	7. Reams and cleans pipe ends.	
	8. Uses various types of adapters and fittings.	
	D. The student selects and maintains various valves.	8
	1. Identifies various types of globe valves.	
	2. Replaces the washer in a globe valve.	
	3. Properly connects and positions valves.	
	4. Identifies the correct water flow and operation of a globe valve.	
	5. Identifies various types of gate valves.	
	6. Disassembles and assembles gate valves.	
	7. Properly tightens a gate valve on pipes.	
	8. Positions gate valve correctly.	
	9. Identifies various types of relief valves and their parts	
	10. Disassembles and assembles a relief valve.	
	11. Identifies water flow through relief valve and connects drain lines.	
	12. Identifies various types of reducing valves.	

Suggested Time Hrs.

13. Disassembles and assembles reducing valves.
14. Identifies the water flow through the valves.
15. Identifies different pattern and types of ballcock valves.
16. Assembles and disassembles ballcock valves and installs new parts.
17. Connects valves correctly and adjusts water flow level.
18. Identifies different types of faucet valves (globe, single lever)
19. Assembles and disassembles globe and single faucet valves.
20. Installs faucet to water line.
21. Cleans and installs areator.

E. The student selects and maintains various plumbing fixtures. 2
   1. Identifies different patterns in consealed waste and overflow.
   2. Disassembles faucet waste and overflow.
   3. Identifies different types and patterns of traps.
   4. Identifies the action and function of a trap.
   5. Indicates the correct location of a trap in relation to a plumbing fixture.

F. The student selects and maintains water pumps. 5
   1. Identifies the basic parts of a water system (pump, pressure switch, tank, air volume control)
   2. Identifies parts of a jet pump and jet body.
   3. Identifies a shallow well and deep well jet body.
   4. Services jet pump bodies
   5. Identifies the various types of submersible pumps.
   6. Identifies correctly the different principles of a submersible and a jet pump.
   7. Identifies the correct pipes for submersible pumps.
   8. Studies various materials used in a storage tank and construction.
   9. Identifies the usable capacity of a storage tank and how it is affected by pressure.
   10. Studies the function and operation of a storage tank pressure switch.
   11. Studies the function of air controls in a storage tank.

G. The student selects and maintains hot water tanks 2
   1. Illustrates various types of hot water tanks
   2. Explains the different heating elements of hot water tanks.

		Suggested Time Hrs.
	3. Understands water recovery rates (regular element verses high recovery verses gas).	
	4. States safety features and functions of automatic controls.	
	5. Understands the location and operation of a fill tank.	
H.	The student designs a sewage disposal system	5
	1. Explains and performs a perculation test and shows how it is used in relation to state codes.	
	2. Selects correct size septic tank and distribution box.	
	3. Explains the correct size of lines and number needed from percolation test.	
	4. Designs ditches for a drainage field.	
	5. Identifies different types of drain tile	
	6. Discusses backfilling of trenches.	
I.	The student understands the steps in planning an irrigation system.	10
	1. Obtains necessary information for designing a system (source of water, amount of water, size and shape of fields, etc.)	
	2. Determines soil, crop, and water factors.	
	3. Calculates time to irrigate one setting, number of settings per day and size of systems required.	
	4. Determines sprinkler spacing and gpm, specific sprinkler head and pressure, number of sprinklers on line, etc.	
	5. Determines proper size of pump and power unit.	